LIS-GCE User's Guide

Coupling High Resolution Earth System Models

Using Advanced Computational Technologies

NASA ESTO AIST NRA-02-OES-04

May 13, 2008

Revision 3.1

History:

Revision	Summary of Changes	Date
1.0	Version 1.0	

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1 Introduction

This is the User's Guide for the Goddard Cumulus Ensemble (GCE) model coupled with the Land Information System (LIS). This document describes how to build and run the code. Updates to this document will provide more detailed instructions on how to configure the executable.

This document consists of 5 sections, described as follows:

1 Introduction: the section you are currently reading

2 Preliminaries: general information, steps, instructions, and definitions used throughout the rest of this document

3 Obtaining the Source Code: the steps needed to download the source code

4 Building the Executable: the steps needed to build the executable

5 Running the Executable: the steps needed to prepare and submit a run, also describes the various run-time configurations

1.1 Release Notes: LIS-GCE version 1.0

1. LIS-GCE version 1.0 uses the GCE 1.0 and LIS 6.0 (Development)

2. This version requires ESMF version 3.1.1

2 Preliminaries

This code has been compiled and run on Linux (Intel) systems. These instructions expect that you are using such a system. In particular you need
Software:

- Linux

    - Intel compiler comp-9.1.049
    - GNU's C and C++ compilers, gcc and g++, version 2.96
    - GNU's make, gmake, version 3.77

You need to create a working directory on your system that has sufficient disk space to install and run in. Throughout the rest of this document this directory shall be refered to as *$WORKING*.

3 Obtaining the Source Code

This section describes how to obtain the source code needed to build the LIS-GCE executable.

The source code is maintained in a Subversion repository; thus, you need the Subversion client (svn) to obtain this code. If you need any help regarding Subversion, please go to http://subversion.tigris.org/.

3.1 Downloading the Source Code

To obtain the source code needed for LIS revision 3.0:

1. Go to LISGCE' "Code Release Page"

   Go to http://lis.gsfc.nasa.gov/Source/LISGCE/index.html/

2. From this page:

   Follow the instructions in the "Source Code" section.

3.2 Source files

Checking out the LIS source code (according the instructions in Section 3) will create a directory named *src*. The structure of *src* is as follows:

Directory Name	Synopsis
gce	GCE source code
lis	LIS source code
include	GCE include files
main	Main program that enables the coupled LIS-GCE code
make	directory containing the makefile for building the executable

Please refer to the LIS users's guide for a detailed description of the LIS source tree.

The LIS Source code documentation may be found on LIS' web-site on LIS' "Public Release Home Page". Follow the "LIS 5.0 Source Code Documentation" link.

4   Building the Executable

This section describes how to build the source code and create the executable
– named LISGCE.

1. Change directory into *$WORKING/*.

   ```
   % cd $WORKING/src
   ```

2. Compile the libraries used by LIS:

   ```
   % cd $WORKING/src/lis/lib/w3lib; gmake
   ```

   ```
   % cd $WORKING/src/lis/lib/w3lib; gmake ifc
   ```

   ```
   % cd $WORKING/src/lis/lib/grib; gmake
   ```

3. Build the LIS source as an external library:

   Edit the *$WORKING/src/lis/make/misc.h* file, ensure that the following
   flags are enabled/defined:

   INC_WATER_PTS

   Change directory into *$WORKING/src/lis/make/*

   ```
   % cd $WORKING/src/lis/make/
   ```

   Link the appropriate *configure.lis* file from *$WORKING/src/lis/arch* di-
   rectory. On discover, for example, use:

   ```
   % ln -s ../arch/configure.lis.linux_ifc configure.lis
   ```

   Run make:

   ```
   % gmake gcelis
   ```

4. Finally build the LISGCE executable:

   ```
   % cd $WORKING/src/make/; gmake
   ```

The user can choose to build the executable without including LIS source
in the build process as well, using the following steps (The user only needs to
check out the GCE source).

1. Change directory into *$WORKING/*.

   ```
   % cd $WORKING/src
   ```

2. edit the file *$WORKING/src/make/misc.h* and make sure that the flag
   INCLUDE_LIS is either disabled or undefined.

3. Build the executable:

   ```
   % cd $WORKING/src/make/; gmake
   ```

4.1 Required Software Libraries

In order to build the LIS executable, the following libraries must be installed on your system:

- Message Passing Interface (MPI)

  - vendor supplied, or
  - MPICH
    (http://http://www-unix.mcs.anl.gov/mpi/mpich/)

- Earth System Modeling Framework (ESMF) version 3.1.1 beta snapshot (http://www.esmf.ucar.edu/)

- bacio

- w3lib

To install the MPI libraries, follow the instructions provided at the MPI URL listed above.

5 Running The Executable

This section describes how to run the executable. Once the `LISGCE` executable is built, a simulation can be performed using the *config.sh* file. Assuming that MPI is installed correctly, the LISGCE simulation is carried out by the following command issued from within the *$WORKING/LIS-GCE/job* directory.

    `% mpirun -np 1 ./LISGCE` or simply

    `% ./LISGCE`

    The `-np` flag indicates the number of processors used in the run. On a multi-processor machine, the parallel processing capbabilities of LIS can be exploited using this flag.

5.1 Configuring Run Via configuration file

This section describes how to configure your LIS run by specifying the options in the *config.sh* "config file".

    See Appendix A to see a sample lis configuration file. The configuration file is self-documented. Refer to the comments within it to configure your run.

A LISGCE Configuration File

This is a sample LISGCE configuration file. The run starts at 01 hours 10 June 2001 and ends at 01 hours 12 June 2001.

```
#Overall configuration
#Time Specifications (Start and stop times)

sss: 0
smn: 0
shr: 13
sda: 6
smo: 6
syr: 2001

ess: 00
emn: 00
ehr: 02
eda: 7
emo: 6
eyr: 2001

#Set this flag to 1 for a coupled run using LIS.
#when set to 0, GCE is run with PLACE as the land model.

do coupled run: 0
coupling interval: 60

#Timestep (Overall model timestep in seconds)

ts: 6

#GCE options
#GCE output directory

GCE output: "OUTPUT"
GCE expcode: 999
Use Radiation: 1

#Radiation timestep in seconds
Radiation timestep: 60
Microphysics timestep: 3600
Dynamics timestep: 3600
irain: 120
istat: 3600
imx: 10
```

```
inp: 3600
imp: 3600
ipbldt: 180
```

References